

Crisis in Latin America

Infrastructure Investment, Employment and the Expectations of Stimulus

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Abstract

Infrastructure investment is a central part of the stimulus plans of the Latin American and the Caribbean (LAC) region as it confronts the growing financial crisis. This paper estimates the potential effects on direct, indirect, and induced employment for different types of infrastructure projects with LAC-specific variables. The analysis finds that the direct and indirect short-term employment generation potential of infrastructure capital investment projects may be considerable—averaging around 40,000 annual jobs per US\$1 billion in LAC, depending upon such variables as the mix of subsectors in the investment program; the technologies deployed; local wages for skilled and unskilled labor; and the

degrees of leakages to imported inputs. While these numbers do not account for substitution effect, they are built around an assumed “basket” of investments that crosses infrastructure sectors most of which are not employment-maximizing. Albeit limited in scope, rural road maintenance projects may employ 200,000 to 500,000 annualized direct jobs for every US\$1 billion spent. The paper also describes the potential risks to effective infrastructure investment in an environment of crisis including sorting and planning contradictions, delayed implementation and impact, affordability, and corruption.

This paper—a product of the Sustainable Development Department’s Economics Unit, Latin American and the Caribbean Region—is part of a larger effort to understand the role of infrastructure investment on short-term and long-term growth. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted via email at jschwartz3@worldbank.org, landres@worldbank.org, and gdragoiu@worldbank.org.

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Crisis in Latin America: Infrastructure Investment, Employment and the Expectations of Stimulus¹

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1. Background

Most of the OECD countries have announced fiscal packages that throw a wide safety net around their economies by attempting to salvage failing strategic businesses, relieve stress on mortgage holders, reduce taxes, provide credits or cash transfers to the poor, and shore up commercial banks, insurers and other hemorrhaging financial institutions. In parallel to those efforts which are aimed at preventing further financial failures and increasing liquidity in the face of a sharp drop in commercial lending, governments are also focusing on economic stimulus through public spending—particularly through infrastructure investment.² This investment-driven response to crisis has revived a decades-old debate about the costs and benefits of injections of public resources into an economy as it enters recession.

As of February 2009, the largest economies in Latin America and the Caribbean (LAC) have announced similar stimulus packages that commit governments to increase spending on public works in general, and infrastructure in particular. Although some of the programs may include investments in public housing and edifices, to date the majority of the projects and programs announced focus on the core infrastructure sectors of transport, water and sanitation, and energy. While discussions continue about the effects of these investments on short-term aggregate demand, governments across the political spectrum show a remarkable proclivity toward infrastructure investment as a stimulus response. Since well-targeted cash transfers may be found to induce consumption effectively and quickly in comparison to expenditure programs, the reasons for the commitment to infrastructure investment as a crisis response tool are worth considering.

At one level, the attractiveness of infrastructure investment may be compared to renting versus purchasing a home. While a cash transfer may appear the general population to be a temporary expenditure that produces no visible results, construction activities result in tangible outputs such as a road, a power plant or an irrigation system. Perhaps even more important to policy makers than the lasting assets—or long-term growth benefits—of the infrastructure being built, may be the perception of fairness and productivity that comes with public expenditure on employment activity as opposed to welfare. While this rationale may have more political value than economic value, the employment generation potential of the proposed investments remain a central feature of their attractiveness. This is particularly important as LAC's unemployment levels rise in the face of the growing crisis. This note provides a preliminary estimate of the employment generation potential for different types of infrastructure investments as per the LAC stimulus packages.

The packages announced by the major economies of the LAC region reflect this emphasis on stimulus through employment generation. In light of the dire need for greater economic activity and the growing hope being placed on stimulus via public works and infrastructure investment, this paper intends to edify the discussion about the real potential for such investments to stimulate growth, both in the short and the long term. The paper will present an estimate of the value of LAC's stimulus packages. We will summarize what we know about the expected impacts of infrastructure investments by differentiating among: i) short-term impacts of infrastructure investment on employment including “red flags” associated with using infrastructure as a tool for combating recession, (such as sorting and planning contradictions, corruption risks; implementation delays, and affordability challenges); ii) short-term impacts of stimulus expenditure on growth; and iii) long-term impacts of infrastructure investment on growth.

² For a summary of recently proposed stimulus packages, see ECLAC (2009).

2. Latin America and the Caribbean's Stimulus Packages

As of February 2009, the largest economies in LAC have had announced stimulus packages that commit governments to increase spending on public works.³ The programs range in size from 0.4 percent to 1.6 percent of each country's Gross Domestic Product (GDP). Extrapolating these commitments⁴ to the region as a whole suggests that governments in the region plan to invest an additional \$25 billion in 2009 in public works—which is about 20 percent beyond the originally planned budget allocations. This represents an additional 0.5 to 1.0 percent of GDP in commitments in public works, raising public capital spending levels to somewhere between 3.0 to 4.0 percent of GDP for the region as a whole.⁵

Table 1 below summarizes the region's major commitments to economic stimulus that have been announced in recent weeks and the estimation of region-wide investment levels. The five countries included in the table represent over 75 percent of the region's population and GDP.

Table 1: Stimulus Plans for LAC, 2009

	2009 Stimulus Pkg Investment in Public Works		Total Public Works (2009)		Ratio Stimulus vs Total Investment
	\$B	% GDP	\$B	% GDP	
Argentina	4.4	1.6%	17.1	6.1%	25.7%
Brazil	6.7	0.5%	23.3	1.7%	28.8%
Chile	0.7	0.4%	4.7	2.7%	15.0%
Mexico	6.9	0.8%	43.6	4.8%	15.8%
Peru	1.6	1.3%	5.8	4.6%	27.6%
LAC (*)	25	0.5% to 1.0%	125	3% to 4%	20%

(*) For the LAC estimates, we extrapolated the figures to those countries without information.

Source: UNECLAC (2009), IMF, National Legislation Data, Consensus Economics (2009), and Authors' calculations.
Note: Many countries have proposed multiyear packages. These estimates capture the additional investments in public work to be implemented in 2009 in addition to the budget proposed previously for the year 2009. (*) For LAC's estimates, we extrapolated the figures to those countries without information.

There is a multi-faceted relevance to the region's decision to sustain or even grow its investment levels in infrastructure in the face of a financial crisis. First, it represents a break with historical practice. In past financial crises, major LAC countries have paid for the largest share of their fiscal rebalancing out of capital investment in infrastructure.⁶ This time, many LAC countries have developed a modest scope for countercyclical fiscal policy and they are using it. Although all capital expenditures (including infrastructure, housing, public buildings, schools, jails, and hospitals) represent an average of 20 to 25 percent of total expenditures (i.e. capital, interest and non-interest current expenditures) in LAC, nearly 50 percent of fiscal rebalancing was taken out of the infrastructure sub-components of capital expenditure in the 1990s. Second, it represents an opportunity to correct for a tradition of under-investment in infrastructure as a share of GDP that

³ Public Works, in this case, refers to infrastructure investments in transport, energy and water as well as public housing and public edifices such as schools and hospitals. The division of expenditure expected among categories and sub-sectors is still unclear in many of the pronouncements.

⁴ Despite our efforts to review all the countries in the region, the information was significant fragment when available. In any case, the countries with available information cover 80 percent of the LAC's GDP.

⁵ In recent years, the LAC Region has seen additional investments in infrastructure from private sector sources totaling between 1 and 2 percent of GDP per year. This range includes telecommunications investments which are mostly private throughout the region but does not include private housing stock. Servén and Calderon (2004b).

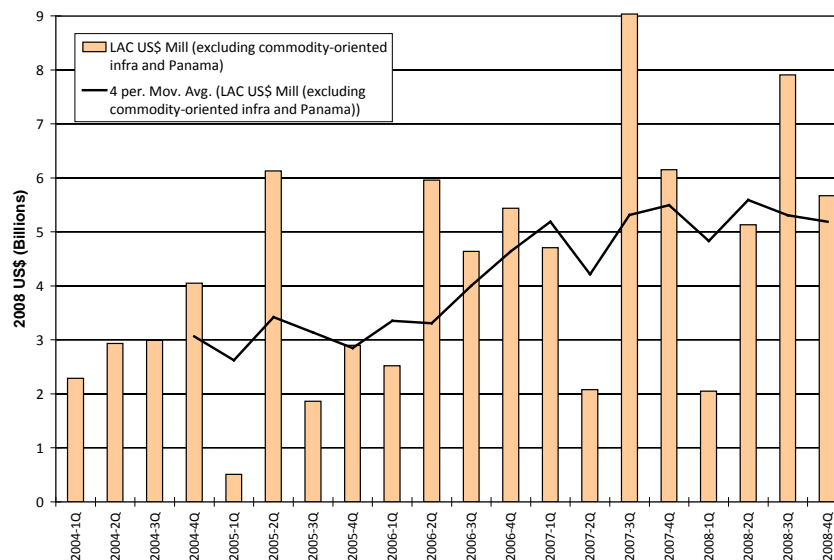
⁶ Calderon, Easterly, and Servén (2004).

has characterized the region's spending habits in recent decades and explained, in part, the declining competitiveness vis-à-vis East Asian economies.

The decision to increase infrastructure investment at the outset of a financial crisis illustrates a venture into the policy realm of stimulus via public investment—even as low commodity prices affected reserves around the region. This may test the limits of the region's rapidly declining fiscal space and rapidly increasing cost of capital. Finally, the reaction of the public sector may be viewed as more realistic with regards to outside sponsorship of projects. Whereas the last response to crisis was to expect the private sector to compensate for decreasing public expenditures, it is now clear that the public's retreat was never replaced in the 1990s.

While the World Bank Private Participation in Infrastructure (PPI) Database finds the rate of private project closure in LAC to be lower in the last quarter of 2008 than in the same period in 2007, an overall decline in the trend of private deals coming to closure is not yet detectable. Project Finance's DealLogic Database, which tracks private flows into all infrastructure projects, shows little change quarter to quarter up through the end of 2008. Despite this uneven overall rising and slight 1-quarter decline, interviews with IFC and banking staff working in the region suggest that private projects are just now beginning to freeze and that debt financing is simply unavailable for most projects. While first quarter 2009 data show continued growth in infrastructure finance, projects appear to be concentrating in fewer countries and fewer sectors. Nearly all investments by value have been in Brazil hydropower projects. There have been practically no utility-level investments in the region, no water sector investments and decreasing transport sector investments as well, aside from the expansion of the Panama Canal which closed in Q42008.⁷ The expectation is that PPI levels will drop considerably through the rest of 2009 in LAC as they have in every other region of the world.⁸

Figure 1: Private Financing to LAC Infrastructure, Quarterly from 2004 to 2008



Source: DealLogic Database, Project Finance, Authors' Calculations

⁷ Projectware Database, Deallogic, as of April 2009.

⁸ See also Izaguirre (2009) which identifies a modest decrease in quarter to quarter PPI projects in LAC coming to closure from 2007 Q4 to 2008 Q4.

In the absence of a significantly higher and better diversified private sector response, the question remains what stimulus effects will be gained by the planned public investments, and whether the initiatives will be sufficient and appropriate for governments to meet their objectives in combating the crisis. In order to assess the potential impact of these investments, it is necessary to define the form of economic stimulus that should be *expected* from the investments. The following sections look at what is known about the impact of infrastructure investment on short-term employment generation; the impact of public expenditure stimulus on short-term growth; and the impact of infrastructure investment on long-term growth and other development factors.

3. The Impact of Infrastructure Investment on Short-Term Employment generation

While little consensus exists about the likely effects of a surge in public investment on short-term growth, there is one sub-component of the growth equation that can be estimated with greater confidence: the impact of infrastructure investment on short-term employment generation. The most comprehensive way to calculate the labor impacts of a single infrastructure investment or project is to consider three levels of impact stemming from an investment⁹: i) Primary Impact: Those directly employed on site to undertake the task at hand; ii) Secondary Impact: Those indirectly employed in the manufacture of materials and equipment as a result of the initial investment; and iii) Tertiary Impact: The induced employment generated by the direct and indirect jobs created. This includes all of the jobs supported by consumer expenditures resulting from wages in the two previous levels.

This is a much simpler calculation than the proof or disproof of a Keynesian growth multiplier since it is built up from a single project or type of investment and focuses on jobs, rather than final growth outcomes.

As an example of how this works, a one-year water supply expansion project that requires 10 people digging holes and laying pipes would create 10 direct jobs. The manufacturing and mobilization of the pipes they lay and equipment they use might be calculated to require 10 more indirect or “secondary” jobs. If the propensity to consume of those 10 direct and 10 indirect employees creates 20 more indirect jobs among shopkeepers, farmers, and other service and goods providers, then the multiplier of the direct jobs might be calculated as 3.0 (i.e., 30 indirect and induced jobs generated for 10 direct jobs funded). Policy makers may look to those multipliers to prioritize—or justify—the investment in proposed projects and programs.

The risks of overstating impact with these multipliers are considerable, however. Here are some “red flags” to consider when calculating labor impacts of investments:

1. *Crowding Out and Substitution Effects*: The risk of crowding out the private sector and “supporting” employment rather than creating incremental jobs is as relevant for this analysis as it is for an analysis of stimulus effects on growth¹⁰. The possibility that the skill requirements for a new investment do not match against the roster of unemployed in a particular country or sub-region would further confine the multiplier.
2. *Local Supply versus Imports*: Secondary effects may be limited by the need to import inputs to construction (e.g., steel, transport equipment, heavy machinery or even energy inputs). To the degree that these inputs come from neighboring countries or other

⁹ See, for example, Heintz and Pollin (2009), and Romer and Bernstein (2009).

¹⁰ See Coenen and Straub (2005) for a discussion and references to many other contributions.

developing countries, they might still be considered of multiplicative value to a regional or global institution although will likely be of little interest to a government counterpart.

3. *Opportunity Cost*: Any social transfer of resources (not just employment generation from works) will generate Tertiary Effects. In fact, since the propensity of the unemployed and the poor to consume is greater than that of the employed, direct transfers may have a higher multiplier than those derived indirectly from other employment-generating schemes. Consumption from direct transfers may also be quicker to enter the economy than those generated by employment from works.

Using an Input-Output Model that considers all levels of inputs to construction, the US Federal Highway Administration has estimated employment generated or supported from investments in highways.¹¹ Although these models have a limited ability to predict “new” employment generation from an economy-wide perspective, their outputs provide a sense of the potential range of employment generation as a result of these interventions. According to these calculations, US\$1billion in road construction results in 6,055 direct jobs on site and another 7,790 in indirect jobs from material supply (Figure 2). The greatest multiplier effect, however, is derived from estimates of the propensity of those workers to consume which create another nearly 14,000 jobs. This would mean a multiplier effect of about 2.0 for the 6,055 direct and indirect jobs created. The limitations of the model are important to consider as these ratios are applied to Latin America and the Caribbean or other developing regions: i) More than half of the employment generation and two-thirds of the multiplier is derived from tertiary effects and are thus based on assumptions about consumption that do not consider the opportunity cost of the original investment;¹² ii) Substitution effects are not considered; and iii) The model is run “nationally” for the US and thus assumes no importation of construction equipment or material.

Keeping in mind the shortcomings of these calculations—and adjusting for them with available data from LAC on wages, leakages by sub-sector, and skilled and unskilled labor divisions—the approach to calculating direct and indirect jobs may provide a basis for estimating the employment generation potential of investments in all areas of infrastructure in countries outside of the US. A review of project documents, IEG reports, and sectoral ESW provides a sufficient starting point for this analysis with information about construction costs and direct employment levels for a variety of infrastructure projects across Latin America. By assigning wage assumptions to workers according to skill sets, estimating domestic and foreign content for both materials and equipment, a leveled set of results in terms of direct employment can be calculated for a given sum of money expended—in this case US\$1billion.

¹¹ JOBMOD2.1: A Comprehensive Model for Estimating Employment Generation from Federal-Aid Highway Projects (2006). Boston University Center for Transportation Studies under subcontract to Battelle Memorial Institute for U.S. Department of Transportation Federal Highway Administration Office of Transportation Policy Studies. See also Weels (2008) for more recent results of this model.

¹² The Obama Administration is anticipating 3.6 million jobs created out of their stimulus package which includes \$170 billion in public works. This calculates to 8,500 jobs per US\$1 billion in works—a third of the USFHWA estimates for primary and secondary effects of highway construction, mainly due a composition of labor intensive public works (highways) and projects that are less labor intensive (energy). That is, the US Government stimulus package seems to have discounted deeply the expectation of induced employment generation in calculating the impact of its works program.

Figure 2: Direct and Indirect Employment Resulting from US\$1B in Highway Spending by the US Federal Government According to US Department of Transportation (2008)

27,800 person-years Spending by the workers employed in the first 2 rounds on consumer goods	13,955 person-years
Indirect employment (industries supplying construction materials) + Equipment & material supply	4,322 person-years + 3,468 person-years
Highway construction	6,055 person-years
	1 st round effects 2 nd round effects 3 rd round effects

Source: Own calculations based on the DOTMOD2 model from the US Federal Highway Administration and Wells (2008).

Table 2 provides the results for Annual Direct Employment per US\$1Billion spent. The most important result of this summary analysis is that the range of direct employment impacts is tremendous: from 750 direct jobs per US\$1billion spent on coal-fired generation projects to 100,000 direct jobs for water supply and sanitation network expansion. In addition, the direct employment generation potential of an investment is thus highly sensitive to: assumptions about wages; the division between skilled and unskilled workers; the sectoral allocation of the proposed program; the technology to be employed in each project; and the potential crowding-out or substitution effects. Indirect job estimates are also highly sensitive to leakage created from the division between locally produced versus imported inputs.

Table 2: Employment Levels for Representative Infrastructure Capital Investment Projects in LAC, by Country and Sub-sector

	Qualified workers	Non-qualified workers	Domestic inputs (mainly material)	Foreign inputs (mainly equipment)	Others	Total	Annual Direct Employment (per US\$1B/yr) [*]
Transport							
Colombia - Access to neighborhoods (streets)	15%	6%	49%	16%	14%	100%	22,500
Colombia - Feeder routes for Transmilenio	43%	27%	23%	6%		99%	35,833
Brazil - Roads	3%	9%	22%	63%	3%	100%	16,577
Argentina- Rosario - highways	1.3%	0.3%	60%	38%	0%	100%	1,650
Water and Sanitation							
Honduras - Improvement on water captation	28%	12%	40%	20%		100%	43,333
Honduras - Rehabilitation of water networks	30%	20%	40%	10%		100%	58,333
Honduras - Expansion of water networks	20%	30%	40%	10%		100%	66,667
Honduras - New treatment plant	10%	10%	80%	0%		100%	25,000
Colombia - Expansion of WSS networks	8%	56%	32%	4%		100%	100,000
Brazil - Rain Drainage networks	8%	16%	48%	28%	0%	100%	34,001
Brazil - Sewerage	4%	11%	68%	17%	0%	100%	21,746
Energy							
US - Solar PV	3%-5%		95%-97%			100%	2,700
US - Wind Power	4%-6%		94%-96%			100%	3,400
US - Biomass	1%-2%		98%-99%			100%	700
US - Coal-fired	1%-2%		98%-99%			100%	750
US - Natural gas-fired	2%-4%		96%-98%			100%	1,700
Brazil - Hydropower	5%-10%		90%-95%			100%	4,500
Peru - Rural Electrification	14%	7%	26%	53%	0%	100%	23,000

Note: [*] These estimates are based on an hourly wage of \$3 for non qualified workers and \$6 for qualified ones for 2,000 working hours a year. See Annex 1 for a discussion of these assumptions.

Source: World Bank project documents: Honduras - Water and Sanitation Program (P103881), Colombia - Bogota Urban Services Project (P074726), Brazil - Bahia Poor Urban Areas Integrated Dev (P081436), Argentina - Santa Fe Road Infrastructure (P099051), and Brazil - Cana Brava hydropower plant. Energy estimates are from the UNEP (2008), Peru - Rural Electrification (P090116), and Brazil - Cana Brava hydropower plant. Authors' calculations.

With those sensitivities in mind, a “prototypical basket” of infrastructure investment¹³ implemented in LAC weighted would generate about 40,000 new direct and indirect jobs per US\$1billion spent. Even with an assumed multiplier of 2.0 for further induced employment and no crowding out or substitution effect, this would mean employment generation of about 80,000 jobs per US\$1billion spent or 2 million jobs for the incremental US\$25 billion so far proposed as stimulus in 2009 in the LAC region. This would represent about 7 percent of LAC’s estimated unemployed in 2009.

The estimates presented in Table 2 correspond to capital investment projects in various countries across the LAC region. There is a sub-set of infrastructure projects, which, however limited in scope, may provide the opportunity for even greater direct employment benefits. That is, rural road maintenance programs typically¹⁴ invest up to 90 percent of the total project costs in labor activities. Regional data suggest that between 200 and 500 jobs are created for every million dollar spent on these initiatives by employing unskilled workers in rural areas paid at the minimum wage.¹⁵ The jobs generated from labor intensive maintenance projects would generate very few indirect jobs because of the lack of material and equipment inputs. Nevertheless, labor intensive projects coupled with well-targeted social programs may be considered a highly progressive intervention for reducing the impact of the crisis on poor rural communities.

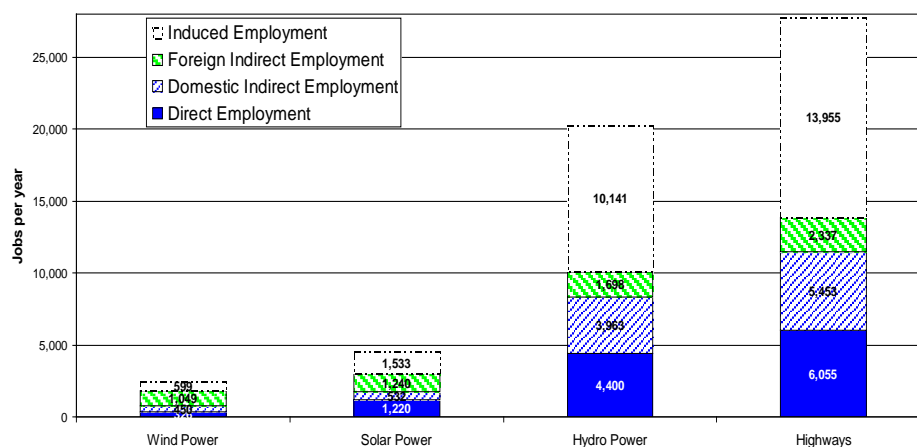
In advising governments on the design of stimulus plans, it becomes clear that the employment story is complex and the investment decision should be made in the context of the overall objective of the government in the medium to long term. To illustrate how nuanced policy recommendation would need to be in the context of employment generation, the Diagram below illustrates the wide range of employment effects according to different renewable energy technologies and juxtaposes those effects against highway construction.

¹³ Based on proposed stimulus packages, we assumed a composition of packages as: 50% in Transport (25% in highways, 20% in urban roads, and 5% in rural roads), 30% in Electricity (25% in generation of electricity and 5% in rural electrification), and 20% in Water and Sanitation (15% in coverage expansion and 5% in treatment plants). We simulated different composition and the estimations were significantly robust.

¹⁴ Peru - Second Rural Roads Project (P044601) and Guatemala - Second Rural and Main Roads Project (P055085).

¹⁵ As with investments in assets, these numbers do not account for substitution effect. As such, the estimates may be most applicable to economies with slack labor conditions and unemployment among day laborers and construction workers in particular.

Figure 3: Estimates of Total Employment Benefits by Types of Intervention for each US\$ Billion Invested, by Sub-sector of Infrastructure



Sources: Authors calculations, World Bank project documents, RDEL (2009) and USDOT.

Beyond the variant labor results, fast and significant expansion of infrastructure investments presents important practical challenges to the efficiency and the efficacy of investment. A shortlist of these challenges might include: Sorting and planning contradictions, Delayed disbursement and impact, Affordability of these packages, and Corruption risk.

Sorting and Planning Contradictions: Under political duress and time constraints, governments may not make the most logical decisions related to investments and prioritization. Infrastructure investments often contain complementarities (e.g., modes of transport assets along a supply chain) or substitution effects (e.g., rail versus road for transport or gas versus electricity supply for heating). They might also contain contradictory character traits intended to meet different objectives. For example, a stimulus program that seeks both environmental sustainability and reduced emissions might struggle to accommodate both goals. A road investment component might meet employment goals, but could contribute to automobilization and higher carbon emissions in the long-term. A renewable energy program or light rail component might meet environmental objectives but may not demonstrate significant employment benefits given the high import components. Federated countries have the exacerbation of competing projects in different jurisdictions that rely on the same foundation for demand. Regional ports (particularly down the eastern coast of Latin America where there is an overabundance of natural harbors), secondary airports and hydroelectric facilities feeding a national grid are all at risk of this redundancy. On the other hand, long-term and short-term goals need not be mutually exclusive. Programs that strengthen existing road networks through rehabilitation and maintenance programs, but also finance increased access to electricity, water and sanitation through network expansions may combine both long-term growth objectives with short-term employment benefits—all with minimal (or positive) environmental impacts. In energy generation, the construction of hydroelectric facilities typically generates 5 to 7 times the jobs of coal plants of equal cost. Again, the long-term benefits—in this case, lower emissions levels and greater energy security—may coincide with the short-term goals of stimulus through employment generation.

In order to reach these goals, the efficacy of national, regional and local planning processes is paramount. Governments may wish to strengthen their capacity for *ex ante* project evaluation;

cross-sectoral convening ability; and the authority to prioritize, scale and permit projects according to impact analysis.¹⁶

Delayed Implementation and Impact: The lifecycle of project preparation for medium or large-scale projects is generally 1 to 3 years, although projects that are simply awaiting financing may be “shovel ready.” This depends upon the depth and quality of existing economic, financial and technical feasibility work as well as the commitment to competitive procurement practices. If projects to be funded are already designed and simply awaiting financing, the timeframe may be significantly shorter as might maintenance and minor rehabilitation contracts. However, it is possible that projects that have been sitting in pipeline will require new demand studies, updated cost projections or even recalibrated willingness and ability to pay analyses given the shifting resources of consumers and the changing prices of inputs in the crisis environment. Moreover, several countries in LAC habitually disburse less than their annually expected disbursements—typically around 75 percent of plan. Given the importance of timeliness in generating stimulus effect, delays and slow disbursements would have a direct and perhaps irreversible effect on the impact of the project.

Affordability of the Stimuli Packages: The potential scope, size and timing of LAC’s proposed stimuli packages will be determined by fiscal space—the room in a government’s budget that allows it to provide resources for additional projects without jeopardizing the sustainability of its financial position or the stability of the economy. In other words, fiscal space must exist or be created if extra resources are to be made available for worthwhile government spending¹⁷. LAC’s proposed stimuli packages present enormous demand on the limited fiscal space in the region and the room for aggressive responses is heterogeneous across the region. The challenge of creating fiscal space for infrastructure expenditure is that governments attempt to do so without compromising other usages such as safety net programs and human development interventions. The government must ensure that the higher expenditure in the short term, and any associated future expenditure—including recurrent spending on operations and maintenance triggered by new infrastructure capital investments or new public services—can be financed from current and future revenues¹⁸. For the LAC countries lacking enough fiscal room, other complementary policies might be necessary such as saving through expenditure rationalization and tax reform, and mobilization of additional resources from borrowing and grants. More so, the current crisis could be an opportunity for LAC to reprioritize expenditures and rid of unproductive spending and unviable subsidies. Several other instruments that may help create fiscal space are: implementing mechanisms that boost efficiency by reducing corruption and improving governance. Albeit difficult during recession, raising revenues for those countries with low ratios of government revenue to GDP may also help to create space.

Corruption Risks: Emergency environments often create the impetus for shortcuts, particularly as they relate to time-consuming safeguard practices. In a crisis situation governments may feel justified in seeking to bypass lengthy procurement policies such as international competitive bidding, pre-qualification, and re-bidding in the case of insufficient competition or non-responsive bids¹⁹. The temptation to trade time for competition raises the risk of corruption,

¹⁶ The Global Experts Team for Public Sector Management, in conjunction with LCSPS, is undertaking a study of best practices in the management of stimulus programs that includes a review of US and other OECD institutional arrangements.

¹⁷ Heller (2005).

¹⁸ Heller (2005).

¹⁹ Kenny (2007).

collusion, and public skepticism. Rushed procurement processes run the risk of being self-defeating and costly elements of stimulus.

4. The Impact of Stimulus Expenditure on Short-Term Growth – A Quick Review

In LAC, as in the US and other OECD countries, the hope for economic stimulus in response to recession is derived from a belief that an injection of capital into an economy that is entering recession or depression can create economic activity through a cascading multiplier effect. This section attempts merely to summarize the terms of debate surrounding short-term growth effects in response to stimulus expenditures during cyclical downturns.

As John Maynard Keynes argued in the early 1930s, the use of a combination of two governmental tools—a reduction in interest rates and public investment in infrastructure—could lead economies out of recession. The injection of income, in particular, would result in greater spending in the economy and employment generation, which in turn would stimulate more production and investment, creating a “multiplication” of the original investment.

Later critics of Keynes’ theories argued that “crowding out” and “substitution” effects would deprive the investments of their intended multipliers²⁰. That is, the result of major new public sector programs would be to crowd out private sector activities and to borrow already active workers from gainful employment rather than create incremental jobs. They also demonstrated that historical evidence of macroeconomic linkages—such as inflation and unemployment—were not relevant under all fiscal policies. In effect, microeconomic models were needed to demonstrate the linkages between policy actions and economic activity.

Without resolving the debate between Keynesian economists and monetarists, a number of studies have sought to calculate the real multiplier effect of investment programs on growth. Because of the variations in fiscal conditions and policies that have accompanied these programs, the range of multipliers derived from such programs is wide. A recent meta-analysis done by the IMF shows that studies of the effect of stimulus investments on growth in advanced economies ranges from 0.1 to 3.1 times the investment levels. Most expenditure multipliers are found to exist in the range of 0.6 to 1.4.²¹

The divergent views of the potential impact of stimulus packages are not limited to clashing historical analyses of the U.S. depression or Japanese Recession. An IMF Staff Decision Note published in March 2009 summarizes the results of a global structural modeling exercise conducted by the Fund’s Research Unit. The authors derive a multiplier of up to 3.0 from stimulus efforts—assuming global initiative, monetary accommodation and a focus on infrastructure investment and short-term targeted transfers. The paper concludes:

“Given the anticipated weakness in the global economy over the next two years, consideration should be given to providing fiscal stimulus that goes beyond the measures already announced. As is clear from our simulations, either government investment expenditure and/or targeted transfers would have sizable multiplier effects on the economy. In an ideal scenario where fiscal stimulus is both global and supported by monetary accommodation, and where financial sectors that are under pressure are being supported by governments, every dollar spent on

²⁰ See, for example, Booth (1983) and Chari et al (2009).

²¹ See, for example Hemming et al. (2002) and Bayoumi and Sgherri (2009).

government investment can increase GDP by about \$3, while every dollar of targeted transfers can increase GDP by about \$1.”²²

By contrast, a Working Paper of the National Bureau of Economic Research released this month recalculates the US stimulus package according to a “Neo-Keynesian” construct and finds multiplier effects of less than 1.0 and decreasing rapidly with time.²³

Since any multiplier less than 1 suggests an investment with a negative return, the outcomes of these single models provide a difficult foundation on which to build a policy framework. That said, the conclusions of the meta-analysis reveal trends among the papers that are instructive: Firstly, short-term multipliers are higher for spending changes than for tax changes according to most macro-models. Secondly, short-term multipliers are generally higher than long-term multipliers, reflecting crowding out effects. And finally, multipliers are higher in developing countries than in developed economies since the marginal propensities to consume and to invest are greater among the poor.

The literature also suggests that multipliers will tend to be positive and possibly large when: i) There is high unemployment and when households are liquidity constrained; ii) Increased government spending does not substitute for private spending, but enhances the productivity of labor and capital; iii) Government debt is low and the government does not face financing constraints; and iv) There is an accompanying monetary expansion with limited inflationary consequences.

5. Proactivity and Short-term Stimulus

In addition to the empirical research on investment and short-term growth outcomes, there is a growing literature in economics that incorporates the effects of consumer and firms’ behavior in response to government action and inaction. While traditional economics assumes that people are rational and behave in a way so as to maximize their individual self-interest, behavioral economics points to other forms of analysis that drives people’s decisions, including heuristics—the reliance of experience, trial-and-error and approximation, and simulation, i.e., not strictly rational analysis; framing—the way a problem or decision is presented; and market inefficiencies or failures.²⁴

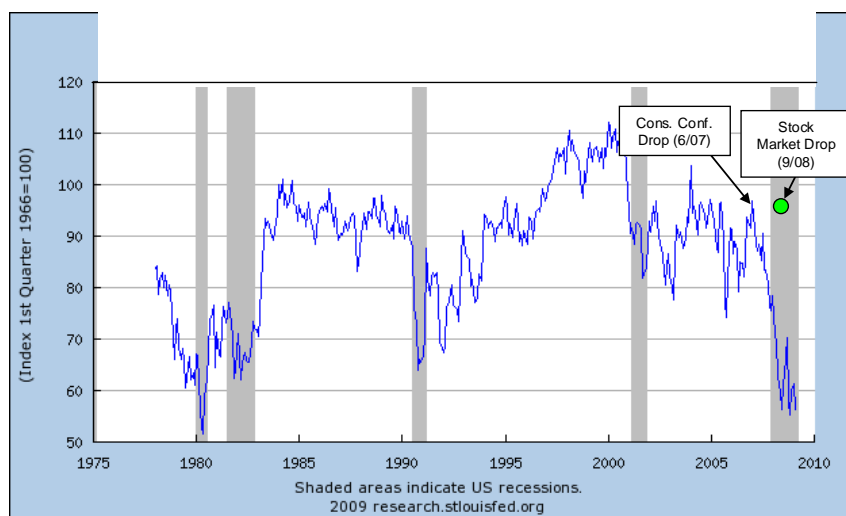
The conclusion of the literature that considers these forces is that observed market outcomes are often contrary to rational expectations and market efficiency. The role of “consumer confidence” indexes in predicting retail sales and influencing markets, for example, illustrates the importance of perception in driving economic activity. Indeed, the Consumer Confidence and Consumer Sentiment Indexes collapsed in the middle of 2007 well in advance of the US stock markets. Likewise, the Consumer Sentiment Index has consistently rebounded prior to the end of recession periods. The diagram below places past US recessions against consumer sentiment showing both the close correlation as well as the slight anticipatory nature of consumer confidence.

²² Freedman, et al (2009).

²³ Cogan, et al, (2009).

²⁴ Kahneman (1982).

**Figure 5: Consumer Sentiment Index, 1975 to 2010,
Illustrating Relationship of Consumer Confidence to US Recessions**



Source: St. Louis Federal Reserve Board (2009).

According to behavioral economics literature, people on average perform poorly at computation when making decisions. In general, they cannot calculate probabilities well, give undue weight to unlikely events, and are strongly influenced by the way in which problems and information are presented to them.²⁵ Since the major driver of stimulus effect is the expenditure's multiplier, which is driven by the propensity to consume, consumers' belief in—or skepticism about—a stimulus package can be, in part, a self-fulfilling prophecy. If consumers do not believe that stimulus is effective, they are more like to hoard—that is, save—their money thereby reducing the multiplier effect. Taken as a whole, therefore, the public's reaction—be it rational or irrational—to the events taking place during a recession can drive the same markets that are meant to reflect the recession.

In light of this behavioral backdrop, many economists are now discussing infrastructure investments as important linchpins in a recovery plan. This is not only in the expectation that such investments may generate capital deployment and jobs but also because they may be viewed more generally by consumers as a reflection of an active government and a rebounding economy. Highly visible infrastructure projects are generally more easily understood than other forms of stimulus—such as government guarantees, resources injected into the financial sector, corporate tax cuts or credits and other types of transfers.²⁶

The current debate about the nature of stimulus in the United States reveals evidence of this behavioral tendency. The US Government's stimulus package sets aside approximately US\$170 billion for public works. This is a fraction of the cost of the financial bailouts, which were originally set at US\$700 billion, but which may climb to well over a trillion dollars in cost. However, the amount of public interest in and discussion about the public works component of the stimulus package outstrips the interest in the financial bailout.²⁷ While it is difficult to

²⁵ Kahneman and Nassim (2009).

²⁶ Stiglitz and Feldstein (2009).

²⁷ Google's search engine calculates that phrases related to the words "Financial Bailout" have attracted less than 14 million hits. The list of all topics related to the financial bailout totals about 40 million hits. By contrast, the phrase "Public Works Projects" alone brings up 125 million hits with the word "Stimulus"

calculate or forecast the relative benefits of “visibility” in stimulus planning, the political economy benefits of governmental concern about employment generation and pro-activity are self-evident as governments around the world scramble to put together stimulus packages. More importantly, they may have real effects on the multipliers needed for recovery.

Of course, at some level the financial markets must also respond to the government plans and may not wait for consumer reaction to condemn a stimulus package. If financial markets are not convinced about the policies and their impact on inflation and sustainable growth, then the cost of capital will rise and an accommodative monetary policy will not be possible. For this reason, the US Administration, for one, has been focusing on establishing a framework for accountability and testing performance and has even been promoting the target of a medium-term balanced budget despite the increased public expenditure. These institutional arrangements and policy initiatives oriented toward fiscal sustainability will become increasingly relevant for LAC as the region seeks to assure financial markets that its stimulus packages are sustainable and not so inflationary that they will prohibit monetary accommodation.

6. Long-term Impacts of Infrastructure Investment on Growth – A Short Review

While the debate about the links between stimulus spending and short-term growth continues to wage, the economic literature on the impact of infrastructure on long-term growth can be described as more decidedly positive. A meta-analysis conducted by the Bank in 2008 that reviews micro and macro analyses of the impact of increases or improvements in infrastructure stocks (or their variations) and literature finds an overall degree of positive outcomes from the existing literature. This holds for both long-run economic growth and specific factor outputs.²⁸

Overall, of the 140 specifications from 64 papers considered, the majority of the empirical literature finds a positive and significant link between infrastructure and development outcome,²⁹ Developing country data lead to positive results slightly more often than those exercises using data from developed economies. These results hold true for different proxies for infrastructure, including measure of public capital (i.e. investment in infrastructure, generally from public sources although not exclusively) or physical indicators. Looking mostly at the public capital stocks of US, the macro-level literature finds very large estimates for the elasticity of infrastructure--between 0.20 and 0.40. These results survive to different proxies of changes in infrastructure's stock and output measures.

To site specific examples, the World Bank found in 2004 that if Latin American countries' infrastructure stocks were to catch up with the regional leader, they would get additional growth of between 1.1 percent and 4.0 percent per year.³⁰ The OECD also examined the relationship between infrastructure investment (including rehabilitation and maintenance) and GDP over time and across countries and found that infrastructure investment drives long-term economic output more than other kinds of physical investment. For example, investments in electricity and telecommunication produce an approximately 0.25 percent increase in long-term economic growth rates for each 10 percent of increase of service penetration.³¹

drawing another 30 million by itself. To the degree that Google search is an indicator, at ¼ or 1/5 the cost, there appears to be about 4 or 5 times as much interest in the stimulus than the bailout.

²⁸ Straub (2008).

²⁹ A small fraction of the literature (6 percent) finds a negative relationship.

³⁰ Calderon and Servén (2004).

³¹ OECD (2009).

Some micro econometric contributions have looked into the issue of infrastructure's impact on development outcomes, ranging from the effect of access to roads on poverty³² to the impact that electricity has on the height of babies³³. Despite a general paucity of impact evaluations of infrastructure interventions, the evidence demonstrates the positive implications of access and quality of infrastructure on productivity and welfare of the population.

The composition of infrastructure investments: It is not surprising that the conclusion of most models is that the balance between new investments vs. maintenance is likely to be sub-optimal. Similarly, growth models imply that lower than optimal levels of maintenance expenditures will generate higher operating costs, both to run the infrastructure facilities and for private capital goods that rely on them. Evidence from the deterioration of rural roads in Africa shows that the loss of road asset values between 1970 and 1989 was 4.5 higher than the potential cost of maintenance to avoid the loss in asset value in the same period.³⁴

The quality dimension can be linked both to the composition of these investments and to the sequencing of the supporting reforms. As for empirical insights about the sequencing of reforms supporting infrastructure investment, they have been concerned with the timing of restructuring measures, the implementation of regulation and, if so, the institutional aspects of it, and the potential introduction of competition.

6. Conclusions

Infrastructure investment is already a central part of the stimulus plans of LAC as they confront the growing financial crisis. Understanding the potential for these planned infrastructure and public works investments to create jobs and foster growth requires a micro-level focus. The macro-analysis linking stimulus to growth is somewhat less conclusive than the micro analysis on infrastructure and employment generation. At the employment level, policy makers and their advisers will require sector-level analysis, comparative technology analysis, and data on the sourcing of inputs to calculate job figures of planned investments. In addition, in order to assure effectiveness of infrastructure investments in a crisis environment, governments will need to redouble their efforts to establish planning processes which weigh the trade-offs associated with multiple investments, procurement processes which are patient and robust in the face of time pressures; and disbursement plans which keep up with the levels of expectation. Finally, short-term plans for infrastructure investment will have to be viewed in the context of the long-term objectives of growth and poverty alleviation which remain infrastructure's fundamental contribution to economic activity.

The main conclusions of the analysis include the following points:

- *Planned Investment Levels:* LAC countries have so far announced about US\$25 billion in stimulus-oriented additional public works for 2009—between 0.5 and 1.0 percent of GDP on average. This increase represents about 20 percent beyond what had been planned. Private flows to infrastructure had only begun to slow at the end of 2008; faster

³² See, for example, Dercon et al (2007), Khandker et al (2009), Mu and van de Walle (2007), and Lokshin and Yemtsov (2005).

³³ Thomas and Straub (1992).

³⁴ Brushett (2005).

decline is likely for 2009. This time around, governments in LAC appear to understand that the private sector will not compensate for public expenditure.³⁵

- Infrastructure Investment and Employment: The employment generation potential of infrastructure investment may be considerable—averaging around 40,000 jobs per US\$1billion in LAC across a mix of subsectors. This excludes the tertiary effects of induced employment generation from direct and indirect employees' consumption³⁶ Albeit limited in scope, rural road maintenance projects initiated through micro-enterprises may produce 200,000 to 500,000 direct jobs per US\$1billion of disbursements. Exact levels of employment generation per basket of investments are highly sensitive to local wages, split between skilled and unskilled labor, the sectors under consideration, the technology being deployed, the degree of importation of inputs, and substitution effect where there is limited slack in the labor market.
- Risks to Effective Infrastructure Investment: A fast and significant expansion of infrastructure investments presents several challenges for Governments. A shortlist of these challenges includes: sorting and planning contradictions, delayed implementation and impact, affordability challenges of the stimuli packages, and corruption risk.
- Impact of Public Expenditure Stimulus on Short-Term Growth: The eventual impact of stimulus programs on short-term growth remains controversial. Although a meta-analysis by the IMF reveals a range of multipliers of fiscal stimulus impact (typically from 0.6 to 1.4), the Fund's Research Unit has just concluded that a potential return of \$3 could be expected from each \$1 of investment in stimulus, assuming a global response, monetary accommodation and a focus on a mix of investment and targeted transfers. There is also a potential cost for governments of doing nothing in the face of recession. Consumer propensity to spend and the confidence that consumers have in future economic activity may be an important variable that drives recovery. As tangible, job-creating and highly visible expenditures, infrastructure investment may help to boost consumer confidence in a government's responsiveness to crisis.
- Impact of Infrastructure Investment on Long-term Growth: There is relatively positive consensus about the long-term benefits to growth and poverty alleviation of infrastructure investment. A recent meta-analysis by the Bank shows many more positive results than negative results related to impacts of infrastructure stock and quality on aggregate growth as well as micro-level factors. OECD analysis produces similar results, showing higher impacts in those countries with lower baselines of infrastructure stock and performance.

³⁵ Private financial flows into the region's infrastructure sectors totaled about \$20 billion dollars in 2008, not including commitments to the expansion of the Panama Canal.

³⁶ Although US estimates from highway construction more than double the employment generation estimates when induced jobs are added, it should be remembered that other forms of transfers from government—tax credits, CCTs, food stamps—would also generate induced employment

Annex 1: Hourly Rate Estimates

The direct and indirect employment generation estimates are highly sensitive to assumptions regarding wages. Wages in the construction sector, as a benchmark, vary significantly across the countries. The following tables present these figures for several countries. For those in South America, the range in wages in this sector is between \$1.39 and \$4.28 per hour, excluding benefits. The (unweighted) average of these wages is \$2.55 per hour. In general, benefits packages are significantly heterogeneous in the region but roughly they are 30 percent in top of the net salary. Using this assumption, we obtain a gross salary of \$3.31 per hour without including other indirect labor costs that are much harder to estimate. Thus, for the purposes of the estimates, we assumed a standardized value of \$3.00 per hour that includes all the related direct labor costs such as health and pension packages.

Table A1: Minimum Wages and Average Wages in the Whole Economy and in the Construction Sector – South America.

	Year of Reference	Minimum	Hourly Average	Construct.	Minimum	Daily Average	Construct.	Minimum	Monthly Average	Construct.
Argentina	2007	1.29	n.a.	n.a.	10.34	n.a.	n.a.	258.43	n.a.	n.a.
Bolivia	2007	0.42	n.a.	1.39	3.34	n.a.	11.14	66.87	n.a.	222.77
Brazil	2009	1.33	n.a.	2.92	10.67	n.a.	23.39	213.30	n.a.	467.89
Chile	2006	1.59	n.a.	3.18	12.73	n.a.	25.41	254.58	n.a.	508.29
Colombia	2007	1.30	1.98	1.64	10.43	15.82	13.13	208.68	316.49	262.68
Ecuador	2007	0.75	n.a.	1.06	6.00	n.a.	n.a.	120.00	n.a.	n.a.
Mexico	2007	0.61	2.70	3.39	4.88	21.63	6.62	97.60	432.69	546.91
Peru	2007	1.00	n.a.	4.28	5.33	n.a.	12.22	159.85	n.a.	685.34
Uruguay	2007	0.82	n.a.	n.a.	6.55	n.a.	n.a.	131.01	n.a.	n.a.
Venezuela	2007	1.79	n.a.	n.a.	9.54	n.a.	n.a.	286.35	n.a.	n.a.
Avg South America		1.09	2.34	2.55	7.98	18.73	15.32	179.67	374.59	448.98

Table A2: Minimum Wages and Average Wages in the Whole Economy and in the Construction Sector – Central America and the Caribbean.

	Year of Reference	Minimum	Hourly Average	Construct.	Minimum	Daily Average	Construct.	Minimum	Monthly Average	Construct.
Costa Rica	2007	1.04	2.36	1.68	8.31	18.92	13.47	166.15	378.34	269.45
Cuba	2006	1.52	2.61	n.a.	12.15	20.90	n.a.	243.01	417.97	n.a.
Dominican Rep.	2004	0.24	0.99	1.74	1.90	7.92	13.94	37.99	158.33	278.75
El Salvador	2007	0.65	1.55	1.42	5.16	12.37	11.37	103.20	247.40	227.30
Guatemala	2006	0.74	1.73	n.a.	5.92	13.80	n.a.	118.38	276.02	n.a.
Nicaragua	2007	0.24	1.75	0.37	1.94	14.02	2.95	38.88	280.36	89.81
Panama	2007	0.89	2.30	2.00	7.12	18.40	16.00	142.40	368.00	320.00
CA and the Caribe		0.76	1.90	1.44	6.07	15.19	11.55	121.43	303.78	237.06

Note: The subregional averages correspond to the simple averages across the countries in the the group with available information.

Source: Authors' calculation based in ILO's documents and several country sources.

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